

Overall progress and future plans for Herschel Data Processing

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Overview



- Overview of Herschel Data Processing
- Major Improvements during the last Year
- What can HSC and HIPE do for your Herschel Data?
- Further Plans and Milestones
- What can you do for HIPE?
- Summary













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Overview of Herschel Data Processing

Overview of Herschel Data Processing

- The system combines for the first time data retrieval, pipeline execution and scientific analysis in one single environment
- All tools for data reduction and analysis, e.g. also the expert applications for e.g. instrument calibration are part of the Data Processing System. Therefore the community has access to the same system as the instrument experts
- The Herschel Data Processing software is coded in Java/Jython to be license free and portable for different operating systems. Currently Linux, MacOSX 10.5 ("Leopard") and Windows XP and Vista are supported
- The Herschel Data Processing software is available under the GNU lesser general public license
- Herschel Science Centre (ESA), the Instrument Control Centres (HIFI, PACS and SPIRE) and NHSC jointly manage and contribute to the Herschel Data Processing System













Overview of Herschel Data Processing

- Herschel Data Processing is a major project, with over 200 contributors and currently 60 full-time equivalents working on calibration, coding, documentation, quality control, testing and tutoring
- Very distributed development we work 24/5 (and often 24/7) on Herschel Data Processing System
- 600 tickets are raised and resolved each month
- 400 code and calibration items are uploaded each month
- A tested HIPE version is released to the Herschel community around every three months. This is currently HIPE 1.1.2. HIPE 1.2.6 will be rolled out immediately after this workshop
- Upon request to helpdesk you can receive access to the latest development builds. This version is not an official release, it is untested, or only under test, and is provided to you at your own risk





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Major Improvements during the last Year



Improvements for the framework

- Installation sped up; size of installer significantly reduced
- Start-up time of HIPE sped up by a factor three
- Several new productivity features in the HIPE code editor
- Much easier to view and change preferences in HIPE
- New graphical interface for examining data products
- Non-blocking opening of FITS files
- More convenient data pool access for HSA and local store
- Local store storage supports gzip
- Caching permits faster access to Herschel Science Archive
- Implementation of sliced and stacked images to reduce memory demands
- Introduction of spectrum explorer framework
- VO table import/export









Improvements for the framework



- SIAM updates to use in-flight knowledge
- Major updates to documentation
 - Existing manuals have been updated and reorganised
 - New manuals for beginners: Read Me First and Quick Start Guide
 - Inclusion of Herschel Products Definitions Document
- Improvements to documentation framework, e.g. improved search functionality and reduction of start-up time
- ... many more improvements will be shown during the HIPE presentations and demos













Improvements for HIFI

- Improved standing wave removal
- Spurs detection
- Improved deconvolution
- Calibration uses in-flight knowledge
 - source coupling
 - chopper calibration
- First version of a customized GUI for the DoGridding task for HIFI OTF mapping
- A new Spectral Fitting Tool was introduced to give a consistent look and feel to viewing and fitting spectra
- ... many more improvements will be shown during the HIFI presentations and demos



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Improvements for PACS

- Scanmap photometer processing:
 - major improvements on photProject
 - introduction of aberration correction
 - algorithmic changes, e.g. on deglitching and high-pass filtering
 - improvements on calibration files, e.g. spatial distortion
 - 0-order flux calibration
- Spectrometer processing:
 - algorithmic changes, e.g. for transients and deglitching
 - SNR increased by a factor two by combining the data from NodA and NodB
 - improvements on calibration files, e.g. flux, spatial and wavelength calibration, new RSRF
- Improved level 2 analysis tools, e.g. cube analysis toolbox and spectrum explorer

... and more improvements will be shown during the PACS presentations and demos









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Improvements for SPIRE

- Scanmap photometer processing:
 - improvements in temperature drift corrections (both calibration and algorithms)
 - addition of a baseline removal to remove striping
 - inclusion of turnaround data in processing to remove ringing artefacts at the edges of maps
 - alternative sigma-kappa deglitching
- Improved demodulation algorithm in jiggle map processing
- Spectrometer processing:
 - spectral mapping pipeline produces now spectral cube
 - merge data from multiple building blocks for long observations
 - Improvement of default baseline correction
- ... and more improvements will be shown during the SPIRE presentations and demos









What can the Herschel Science **Centre and HIPE do** for your Herschel data?



Herschel Pipeline Processing and Data Quality Control

- Pipelines are executed on the ESAC Grid to produce Herschel Products to different reduction levels
 - Level 0 raw data
 - Level 1 instrumental and satellite effects removed
 - Level 2 scientific analysis can be performed
- The data are available in the Herschel Science Archive after the processing is finished (usually on the same day of reception of the data from the satellite)
- The full data quality control cycle by the Technical Assistants and Instrument Calibration Scientists takes a few days
 - data quality control is a combination of automatic screening and manual inspection
 - quality control reports are electronically distributed to experts













Herschel Pipeline Processing and Data Quality Control











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SERVATOR

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HIFI 'first light' of DR21 star forming region during OD 39



Pipeline processing with operational (pre-launch) pipeline

Interactive data processing

SPIRE

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HIFI 'first light' of DR21 star forming region during OD 39 – Final sky spectra





Interactive (left – one mapping element) and **standard pipeline** (right – average of 5 mapping elements) results for HIFI first light using the HRS spectrometer, used simultaneously with the WBS spectrometer.



SPIRE 'first light' of M66 during OD 42







Interactive data reduction Current pipeline processing









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SPIRE 'first light' of M74 during OD 42





250 µm





Interactive data reduction









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PACS/SPIRE parallel mode observations of the Milky Way











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Further Plans and Milestones

Future improvements for the framework



- Improved queue assignment within ESAC grid and reduction of system load stemming from DP and HSA to improve throughput for future bulk reprocessing exercises
- Reducing the size of the builds by moving the calibration files to the HSA and calibration pools
- Implementation of additional auxiliary products
- Improvements to Quality Control framework, especially to support the bulk reprocessing exercises
- Support of Windows7 and MacOSX 10.6 ("Snow Leopard")
- Improved automatic testing to improve confidence in developer builds and speed-up delivery cycle for releases to the community













- Refinement of instrument algorithms and calibration
 - deconvolution of frequency switch observations
 - automatic deconvolution for HIFI spectral surveys
 - automatic removal of standing waves in pipeline
- Improvements of interactive tools
 - tool to transform and visualise different frequency domain coordinates for spectra and do transformations between these domains (e.g. sky-frequency, line rest frequency)
 - tool to clean-up/prepare a HIFI spectrum
 - tool to display HIFI line intensity, width, shape and velocity maps
- Improvement of quality control criteria and rules
- Implementation of browse products and icons for Herschel Science Archive

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SPACE OBSERVATORI

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Future improvements for PACS

- Reduction of memory imprint
- Reduction of size for very large PACS products
- Refinement of instrument algorithms and calibration
- Improvements of pipeline: Generation of maps combining many different separate observations
- Improvements of interactive tools:
 - spectrometer dot-cloud processor to fit spectra on the PACS spectrometer Level 1 dot-cloud
 - tool for PACS wavelength switching spectroscopy data reduction
 - point source photometry tool to combine all beams
- Improvement of quality control criteria and rules
- Implementation of browse products and icons for Herschel Science Archive













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Future improvements for SPIRE



- Refinement of instrument algorithms and calibration
 - correction for residual correlated noise/thermal effects
 - enhanced channel fringe removal
 - optimal handling of noise co-variance
 - pointing checks/ improved registration using sources in repeated map data to check and refine pointing information and to improve the signal-to-noise ratio in deep scans
- Improvements of pipeline: Generation of maps combining many different separate observations
- Improvements of interactive tools
 - tool to visualise and analyse spectral cubes to enhance data interpretation for spectral maps
- Improvement of quality control criteria and rules
- Implementation of browse products and icons for Herschel Science Archive



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Next Steps and Schedule



HERSCHEL OBSERVATORY

January 2010	HIPE 2.0 becomes operational, start of bulk reprocessing of data taken in SDP and PV phase
January 2010	Release of HIPE 2.0 for HIPE beta-users
Early 2010	Release of HIPE 2.0 to the community at large & opening of the Herschel Science Archive
Spring 2010	"Bonne idée" meeting to detail the topics for the following two years of Herschel Data processing development
~April 2010	Release of HIPE 3.0
~July 2010	Release of HIPE 4.0
~Nov. 2010	Release of HIPE 5.0
~March 2011	Release of HIPE 6.0

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What can you do for HIPE?

HIPE

Participate in Herschel Data Processing User's and Interest Groups

Collaborate to HIPE development as contributor and tester

More information will be provided in session 9a

Herschel Interactive Processing Environment

creating "Welcome" view

Summary.





- Herschel Data Processing supported Herschel's Commissioning, Performance Verification and Science Demonstration Phase
- Herschel Data Processing was able to support the early delivery of science data to the users community
- Early 2010 the availability of HIPE 2.0 to the whole Herschel community will be announced together with the opening of the Herschel Science Archive
- The Herschel Data Processing System is ready to support the analysis of *your* Herschel SDP data
- You can follow the Herschel news at

http://herschel.esac.esa.int/HIPE_download.shtml

http://herschel.esac.esa.int/Data_Processing.shtml

http://herschel.esac.esa.int/latest_news.shtml













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